

# **VD-PD**

# **SiPM-Hybrid connection**

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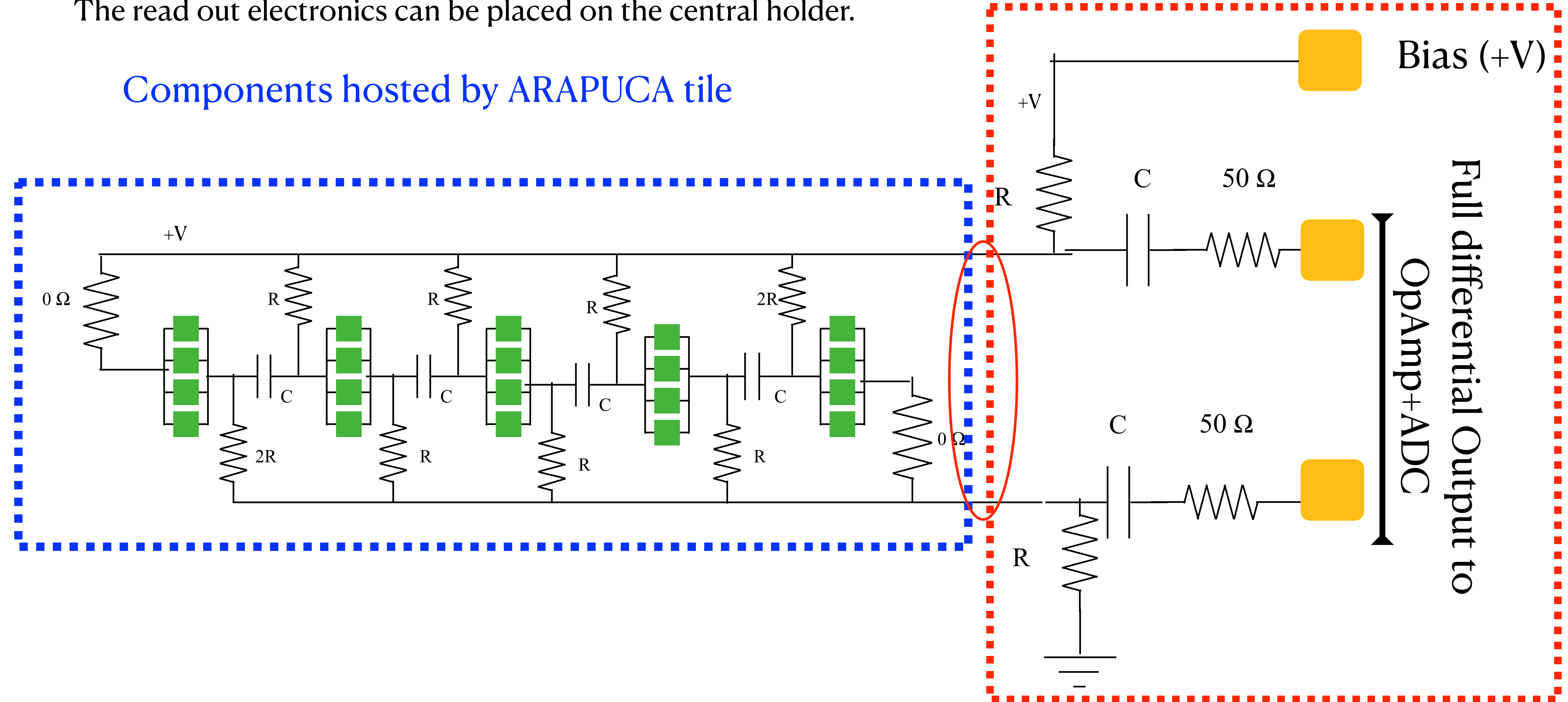
April 12, 2021

# 20 SiPM-Hybrid (passive) connection

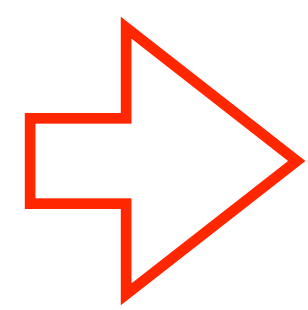
8 "BLUE" groups per each tile, each group need a twisted cable,  
The read out electronics can be placed on the central holder.

Components hosted by ARAPUCA tile

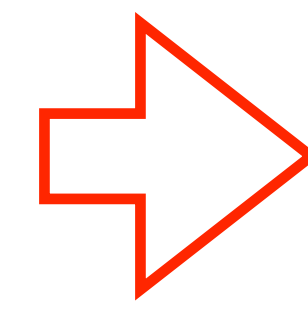
Components on the  
central electronics board



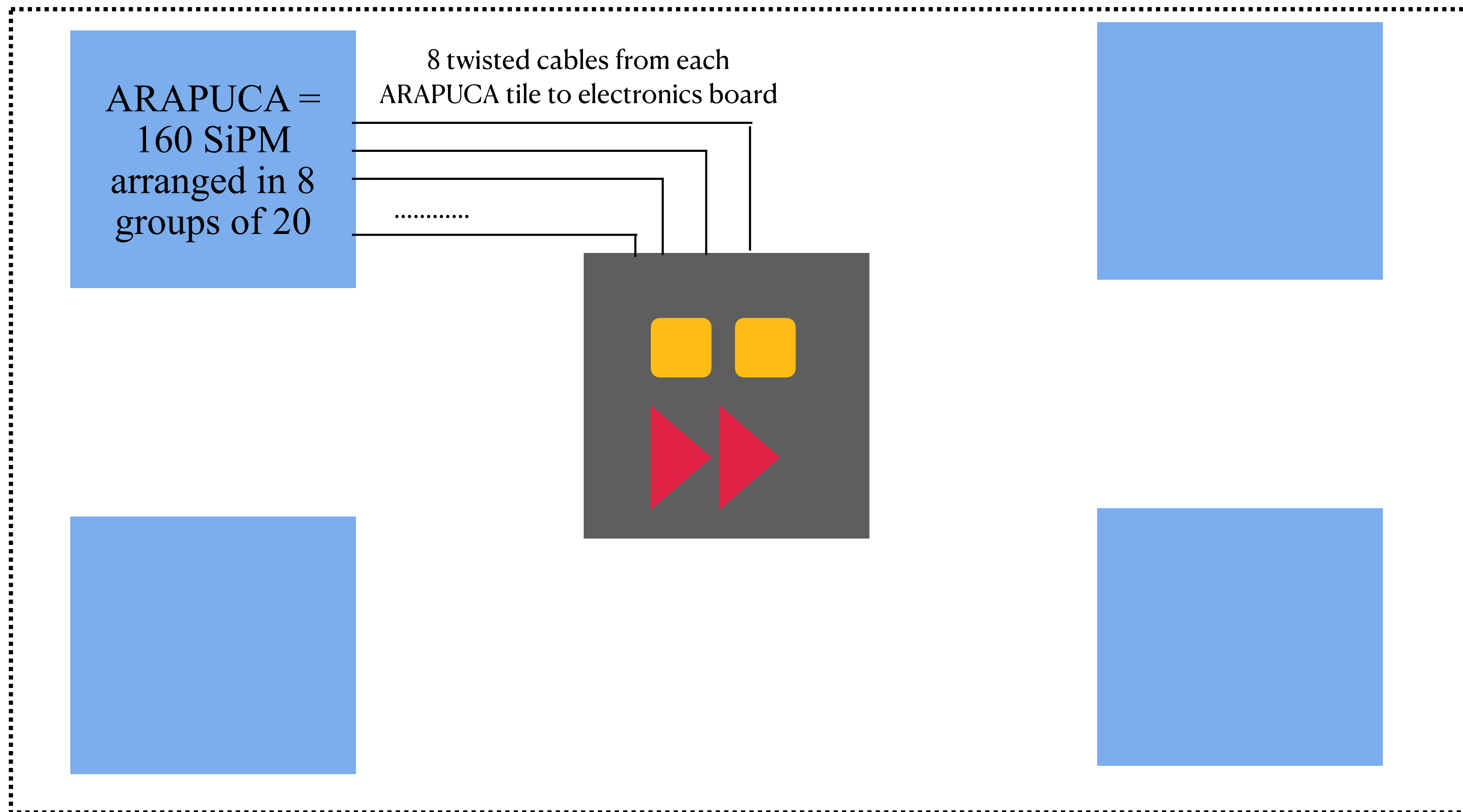
1 X-ARAPUCA = 160  
SiPM = 8 groups of 20 in  
Passive-Hybrid



8 twisted cables from  
each ARAPUCA tile to  
electronics board

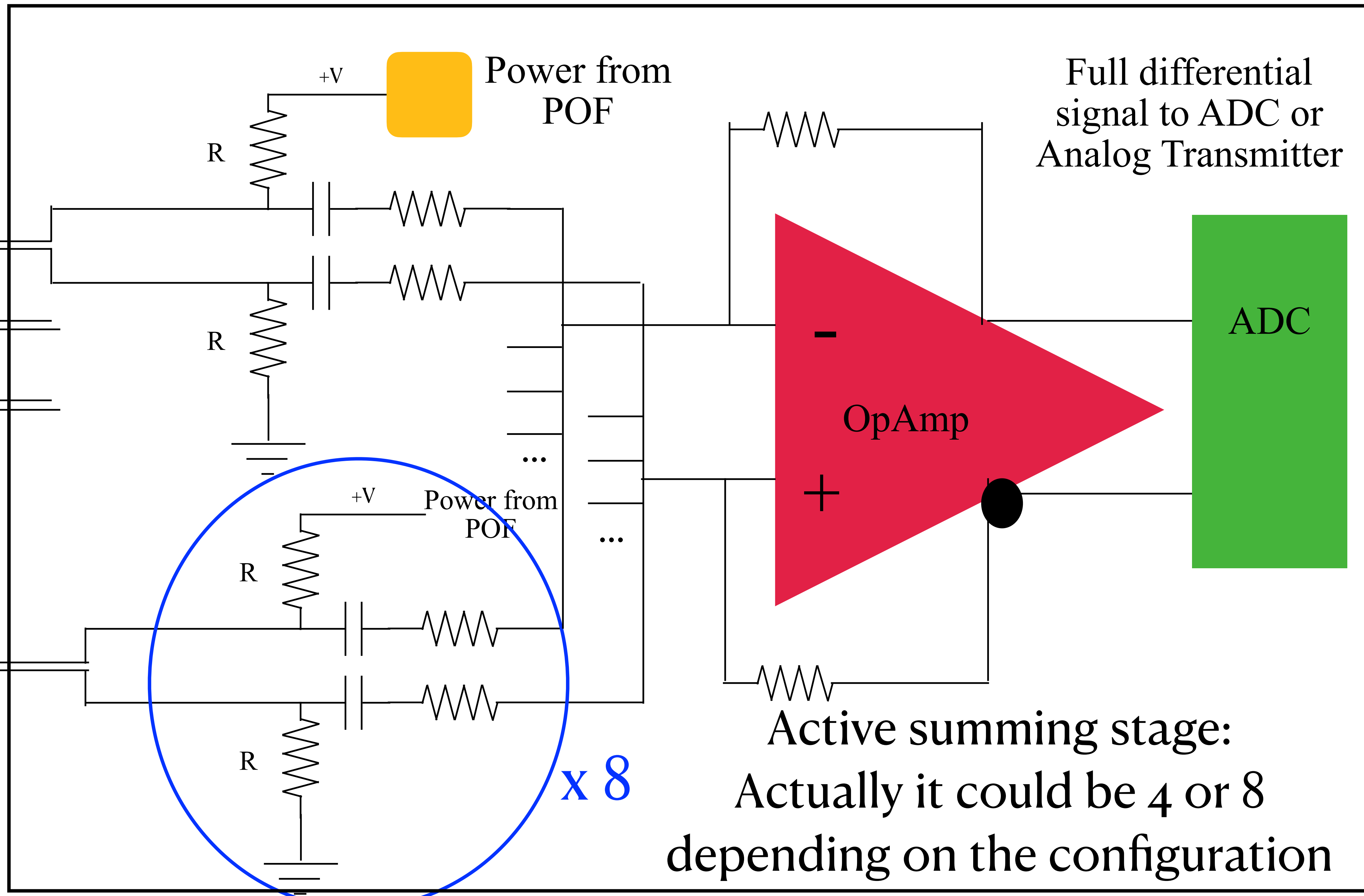


Similar cables to ones  
used in protoDUNE



Read out electronics:

8 twisted cables from each tile



Power from POF

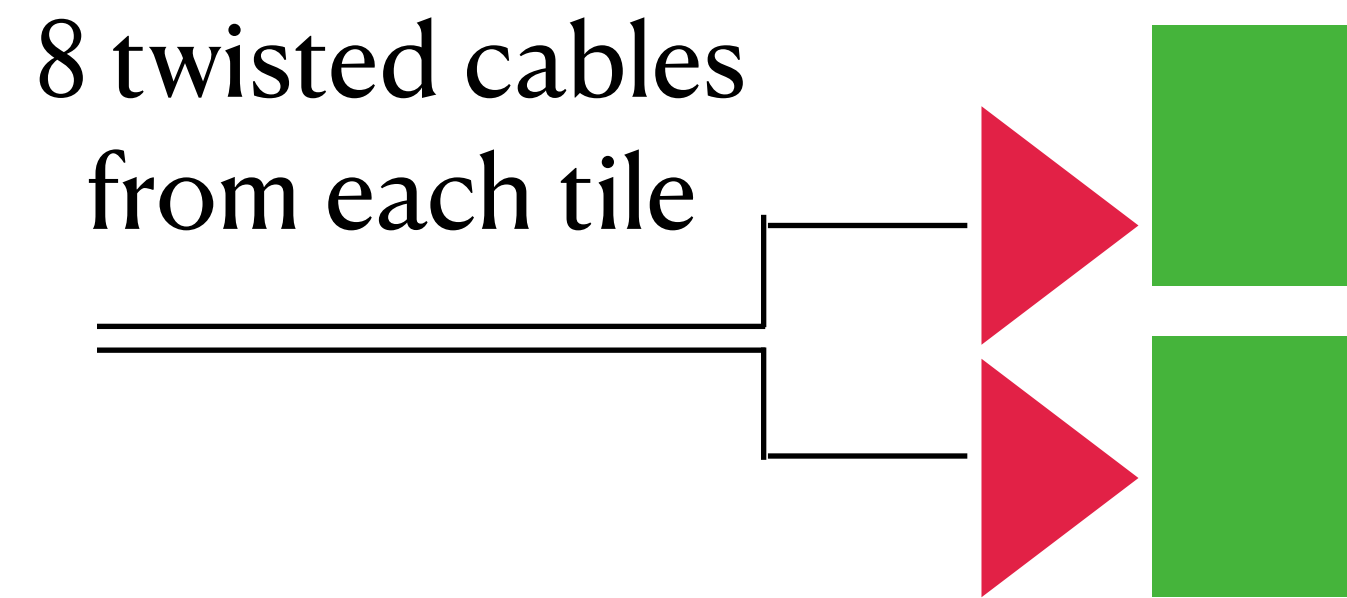
Full differential signal to ADC or Analog Transmitter

ADC

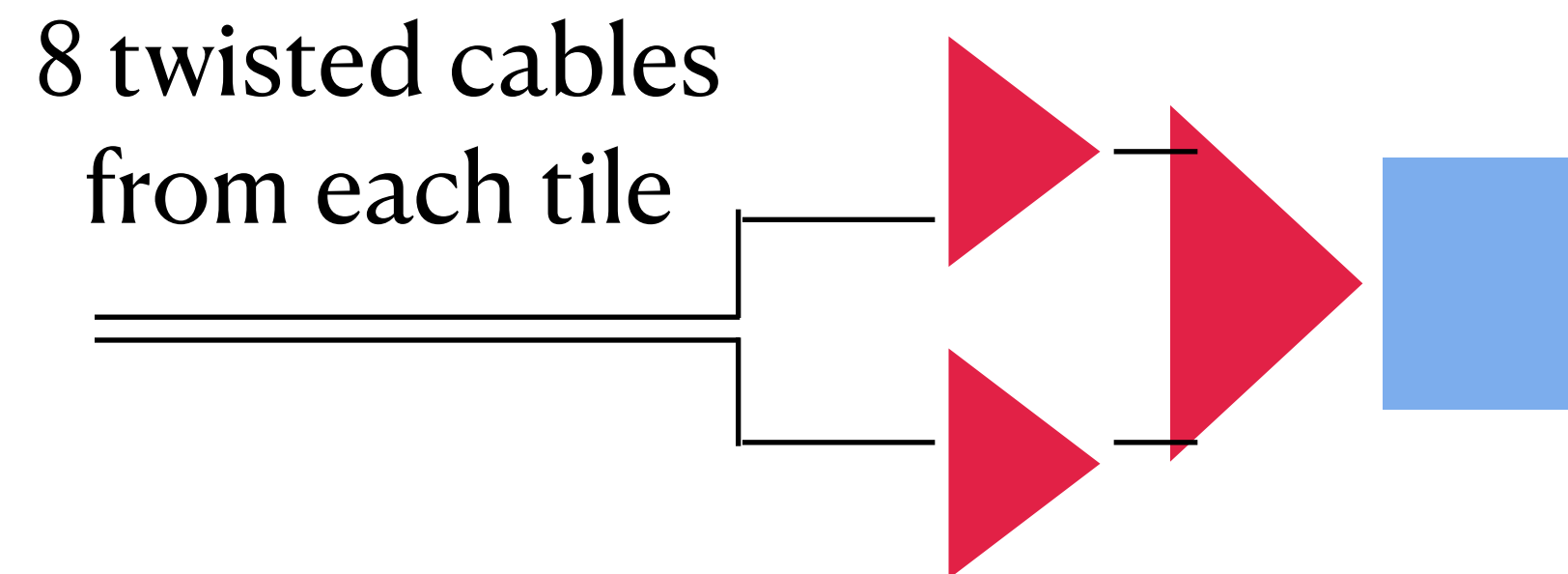
OpAmp

Active summing stage:  
Actually it could be 4 or 8 depending on the configuration

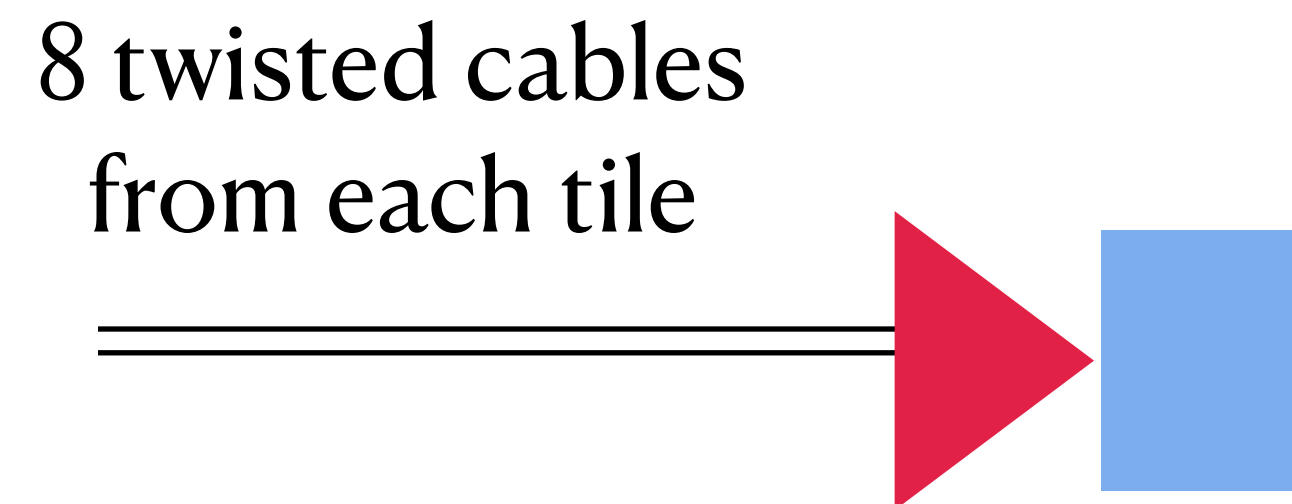
# Possible configurations:



Digital + 2 ADC per tile -> 4 twisted  
cables per OpAmp per ADC



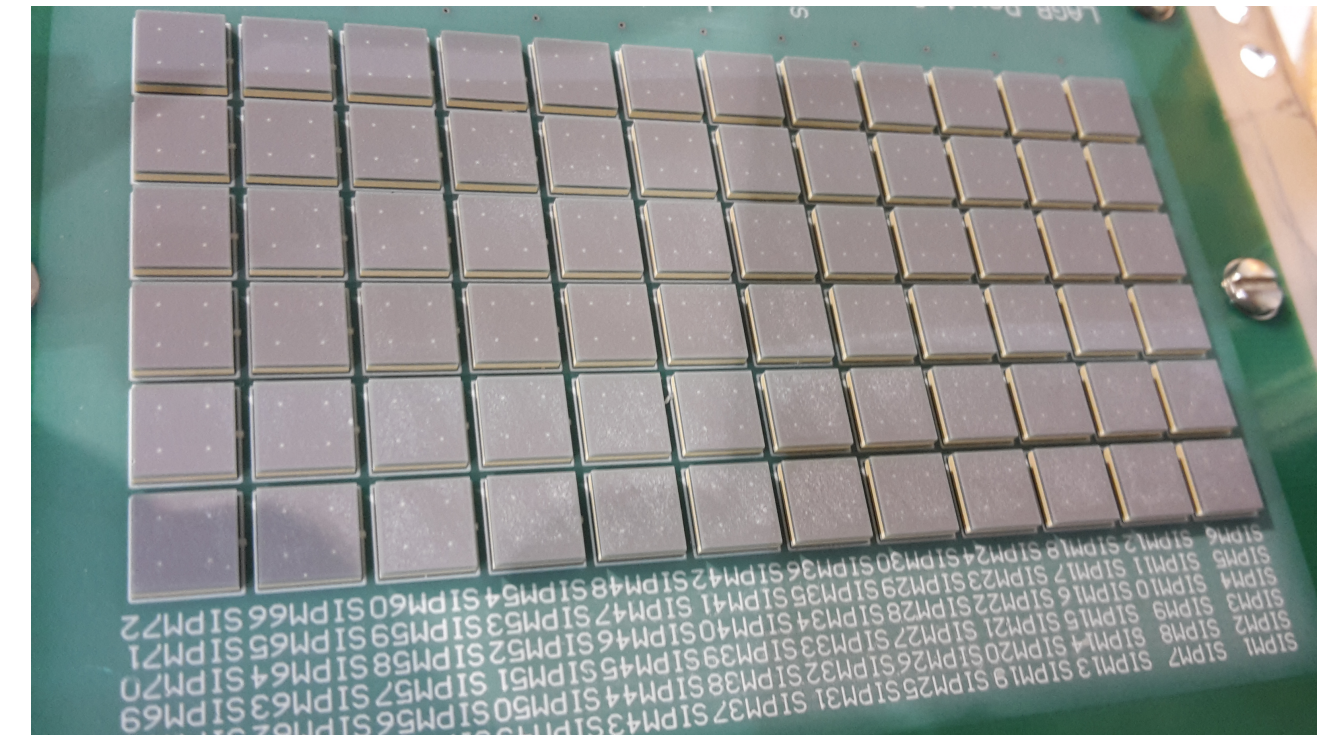
Analog Double + double summing stage ->  
4 twisted cables per OpAmp + Second  
OpAmp to summing 4+4 -> Analog output



Analog Double + summing stage -> 8 twisted  
cables in a single OpAmp-> Analog output

# What we know and what has to be tested

Summing 8 channels in a single OpAmp is already been tested (we summed successfully 12 groups of 6 SiPM in parallel each one).



12 groups of 6 SiPM Hamamtsu 6x6 mm<sup>2</sup>

A single Hybrid circuit of 20 SiPM need a stand alone test.

Final configuration: 8 groups of 20 SiPM in a single channel node.

# Considerations on front-end electronics on the central board:

## **Pro:**

- ARAPUCA tile design is not affected by the choice of the readout electronics
- OpAmp summing stage is the same needed for the ADC stage
- OpAmp stage near PoF and ADC or Analog transmitter (usually this is a recommendation for the OpAmp ADC interface)
- Avoid an OpAmp stage on the tile reduce spread of power distribution

## **Contra:**

- 8 twisted cables from each tile